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16. ABSTRACT

What are the prospects for rapid acceptance tests of asphalt pavement? Are we near to that little black box with all the answers? Probably not, but maybe if we look close we have its equivalent. In any case, we should examine what we need to obtain a good asphalt pavement.

First, of course, we need materials which when properly put together give a mixture that will be strong enough to support traffic without distortion for 10 to 20 years. In addition, the pavement must present a level non-skid surface for the same period. This means that it must not only resist the stresses, strains and wear of traffic but also the attacks of mother nature.

In order to accomplish this the aggregate we use must be clean, properly graded, mostly crushed, tough, durable, not too absorbent, stable under varying moisture conditions and free of clay. Then after mixing with the optimum amount of asphalt; the combined aggregate must supply a load stable mix that is insensitive to moisture, dimensionally stable, and polish resistant.

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PROSPECTS FOR RAPID ACCEPTANCE TESTS

By

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What are the prospects for rapid acceptance tests of asphalt pavement? Are we near to that little black box with all the answers? Probably not, but maybe if we look close we have its equivalent. In any case, we should examine what we need to obtain a good asphalt pavement.

First, of course, we need materials which when properly put together give a mixture that will be strong enough to support traffic without distortion for 10 to 20 years. In addition, the pavement must present a level non-skid surface for the same period. This means that it must not only resist the stresses, strains and wear of traffic but also the attacks of mother nature.

In order to accomplish this the aggregate we use must be clean, properly graded, mostly crushed, tough, durable, not too absorbent, stable under varying moisture conditions and free of clay. Then after mixing with the optimum amount of asphalt, the combined aggregate must supply a load stable mix that is insensitive to moisture, dimensionally stable, and polish resistant.

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The other major material is asphalt. Asphalt, similar to aggregate, is essentially a natural material. However, in the natural state it varies considerably and so when used it is usually a blend of refined asphalts manufacturred from various crude sources, at least insofar as paving asphalts are concerned. Asphalt must furnish good adhesion to the aggregate and provide cohesiveness to the mixture. In addition, it must be durable under varying weather conditions.

So we are dealing with two natural materials which must be properly selected and then properly combined and placed to give the most economicalservice life under the anticipated conditions. If one defines acceptance testing as testing the final product in place for acceptance, then at present we have the possibility of rapid acceptance testing. Assuming that the procedure and equipment used by the contractor to select and place the materials is comprehensive and can be checked, then the owner merely needs an audit program of the materials for quality and then check the completed pavement for density, thickness, profile, cross slope, and skid resistance. With the exception of the material tests, these tests are all fairly rapid. Such a program must be statistically accurate and a procedure to be followed in case of failure must be specified in advance.

As indicated above, the problem area insofar as rapid testing is concerned, is the determination of the quality of the materials.

Thickness can be scaled. Profile can be measured by a profilograph or by a straightedge. Cross slope by a straightedge and skid resistance by a portable skid tester (California, British, etc.), or even a full size skid trailer. Relative density can be immediately measured by a nuclear device. Gradations can be screened. This requires removal of the asphalt and so cannot be classified as a rapid test but results can be otained relatively soon. Asphalt quantity is probably the slowest of the quantification tests since it is normally a laboratory type test that needs time and careful procedures, however, at present a nuclear test is being developed that holds promise for speed providing the moisture can be determined. In addition there are large size vacuum pycnometers on the market that can be used for the same purpose.

Without a doubt the material quality tests are the slowest of the tests listed above, however, some agencies require a stability test which also can be rather lengthy. Unfortunately there are no rapid tests on the horizon insofar as this group are concerned. This need not prevent the development of a rapid acceptance test program, if one is willing to control stability in another manner. It is really dependent on the overall control and acceptance testing program.

Therefore, if a rapid acceptance program is desirable (and I think it is to the benefit of both the contractor and the owner) then an overall systems approach using either a combined control and acceptance system (or using a method specification in areas where control tests are too cumbersome), or a prequalification

rapid acceptance testing procedure would be appropriate. Following either of these systems all materials control tests must be finished before they are combined into the pavement mix. One of the keys to either program is the prequalification of the asphalt and aggregate. In other words, the materials must be pre-selected and the mix design must be set.

Asphalt in most cases is now being furnished to a viscosity specification (AASHO M226) rather than the old penetration system. We here on the West Coast use Table III which requires determination of the viscosity of the aged residue (AR) after the rolling thin film test and we feel insures better uniformity during laydown. Whatever specification is used, asphalt is a plant blended material and is subject to relatively close control. It can therefore be safely accepted on certification from any responsible producer. A certification program does not mean that the owner merely accepts a product because the supplier says it meets the specifications. Such a program calls for an acceptable control procedure by the supplier subject to review and check by the owner followed by audit sampling at the last practical moment. For asphalt this is usually at the feed line to mixer. Enforcement is by withdrawal of certification privileges on future projects for lack of consistent compliance with specifications in addition to a monetary penalty or removal of the specific project pavement.

Aggregate from any plant can be handled in this same manner, however, from a specific pit it works only so long as the character of the material does not change. Radical changes are easy to observe but some of the more subtle changes need a quick test

such as the sand equivalent to identify. Commercial plants tend to have control programs as an economic part of their plant management, however, project developed pits are not necessarily under such control.

In my opinion considering the present state of the art the following procedure contains sufficient safeguards for the owner yet can provide a rapid acceptance of the pavement. Simply stated this procedure requires that all materials be pretested and accepted in the bins or tanks before use, that the plant be automated so each ingredient can be controlled by weight or volume such that a predesigned mix is mixed and delivered to the trucks at the proper temperature. With these safeguards then the finished pavement can be checked by existing and proven rapid acceptance tests. Visual inspection is sufficient to cover such items as tears, gouges, ridges, indentations or other marks. Relative density can be directly measured by nuclear equipment, thickness and profile by direct measurements, levelness and cross slope by a straightedge.

This all sounds rather simple and actually it is, however, it depends on a statistically correct control and acceptance system, mutual cooperation between the owner, producer and contractor, and of most importance, good contract administration. Quantities of materials entering the mix may be measured going through an automated plant in several acceptable ways. The important thing being that the plant is prequalified and that the inspector understands its operation. Quantities for pay

purposes best may be measured in place by the length and width with the thickness checked by cores.

I have not discussed the allocation of responsibility for control testing nor acceptance testing of asphalt paving because it is somewhat incidental to my main theme of rapid acceptance testing. However, as implied, a rapid acceptance testing program under the present state-of-the-art is not possible unless the owner can assure himself early of certain fundamental material and mix properties. For instance, mix stability is best established by preliminary mix design, then controlled by asphalt content, aggregate shape and grading. Thus, final acceptance of stability can best be based on control tests either performed by the owner or by the plant subject to careful check by the owner.

In summary, rapid acceptance programs for asphalt pavement are now available. Such programs must be designed so that those items requiring overnight or longer laboratory type tests can be accepted before the mixing operation is started. This includes all material quality tests and those pavement quality tests not subject to last minute testing such as stability. The success of any acceptance program depends on a clear contractural agreement between the owner and contractor of the consequences of non-compliance.